53. (New) A reactor as in claim 1, further comprising at least one cell.

54. (New) A reactor as in claim 53, wherein the at least one cell is located within the chamber.

55. (New) A reactor as in claim 53, wherein the at least one cell is immobilized.

56. (New) A reactor as in claim 53, wherein the at least one cell is able to grow during the chemical or biological reaction.

57. (New) A reactor as in claim 53, wherein the at least one cell is able to metabolize the starting material.

58. (New) A reactor for carrying out a reaction involving at least one living cell, comprising:

a reaction unit including a chamber having a volume of less than 1 ml, an inlet for adding at least one living cell to the chamber, and an outlet for release of a product of a reaction involving the at least one living cell.

59. (New) A reactor as in claim 58, wherein the reactor further comprises an inlet connectable to a source of a chemical or biological starting material.

60. (New) A reactor as in claim 58, wherein the reaction comprises a chemical or biological reaction.

61. (New) A reactor as in claim 58, the chamber having a volume of less than about 100 microliters.

62. (New) A reactor as in claim 58, the chamber having a volume of less than about 10 microliters.

63. (New) A reactor as in claim 58, the chamber having a volume of less than about 5 microliters.

64. (New) A reactor as in claim 58, the chamber having a volume of less than about 1 microliter.

65. (New) A reactor as in claim 58, wherein the reaction unit comprises an etched portion of an article.

66. (New) A reactor as in claim 65, wherein the reaction unit chamber comprises etched silicon.

67. (New) A reactor as in claim 58, further comprising a mixing unit fluidly connectable to the inlet of the chamber.

68. (New) A reactor as in claim 67, the mixing unit including an outlet connectable to the inlet of the reaction chamber, a plurality of inlets each in fluid communication with the outlet and a mixing chamber between plurality of inlets and of the outlet.

69. (New) A reactor as in claim 68, wherein the mixing unit chamber is free of active mixing elements.

70. (New) A reactor as in claim 69, wherein the mixing chamber is constructed and arranged to coalesce a plurality of reactant fluids provided through the plurality of inlets and to cause turbulence in the fluids thereby mixing and delivering a mixture of the reactant fluids through the outlet of the mixing chamber.

71. (New) A reactor as in claim 70, wherein the mixing unit includes a fluid flow path between the plurality of inlets and the outlet and a plurality of obstructions in the flow path constructed to cause mixture of fluid flowing through the flow path.

72. (New) A reactor as in claim 67 wherein the mixing unit is attachable to and separable from the reaction unit.

73. (New) A reactor as in claim 67, wherein the mixing chamber includes a volume, between the plurality of inlets and the outlet, of less than 1 liter.

74. (New) A reactor as in claim 67, wherein the mixing chamber includes a volume, between the plurality of inlets and the outlet, of less than 10 microliters.

75. (New) A reactor as in claim 58, further comprising a heating unit having an inlet, and an outlet connectable to the inlet of the reaction chamber, the heating unit separable from and attachable to the reaction chamber.

76. (New) A reactor as in claim 58, further comprising a heating unit having an inlet, and an outlet fluidly connectable to the inlet of the reaction chamber, the heating unit separable from and attachable to the reaction chamber.

77. (New) A reactor as in claim 76, wherein the heating unit includes an inlet, and a plurality of outlets fluidly connected to the inlet.

78. (New) A reactor as in claim 58, further comprising a heating and dispersion unit having an inlet, and an outlet connectable to the inlet of the reaction chamber, the heating and dispersion unit separable from and attachable to the reaction chamber.

79. (New) A reactor as in claim 78, wherein the heating and dispersion unit includes an inlet and a plurality of outlets connected to the inlet.

80. (New) A reactor as in claim 79, further comprising a mixing unit having a plurality of inlets communicating with a mixing chamber, the mixing chamber communicating with an outlet, wherein the outlets of the heating and dispersion units are connectable to the inlet of the reactor, and the inlet of the heating and dispersion unit is connectable to the outlet of the mixing unit.

81. (New) A reactor as in claim 78, wherein the dispersion unit is constructed and arranged to maintain fluid exiting the unit through the plurality of outlets at a temperature of approximately 30 °C.

82. (New) A reactor as in claim 58, wherein the reaction chamber is constructed and arranged for cell cultivation.

83. (New) A reactor as in claim 82, wherein the reaction chamber has a surface adapted for immobilization of at least one cell.

84. (New) A reactor as in claim 58, further comprising a separation unit having an inlet and an outlet, the inlet connectable to the outlet of the reaction chamber.

85. (New) A reactor as in claim 84, wherein the separation unit is connectable to and removable from the reaction chamber.

86. (New) A reactor as in claim 84, wherein the separation unit includes an inlet connectable to the outlet of the reaction chamber, a carrier fluid outlet, a fluid pathway connecting the inlet with the carrier fluid outlet, and a size-selective membrane positioned to contact fluid flowing from the inlet to the fluid carrier outlet.

87. (New) A reactor as in claim 86, wherein the membrane has a first side positioned to contact fluid flowing from the inlet to the fluid flow outlet and an opposing second side defining in part a product extraction solvent flow pathway.

88. (New) A reactor as in claim 86, wherein the carrier fluid outlet is connectable to a recovery container for recycling of reaction carrier fluid.

89. (New) A reactor as in claim 58, further comprising at least one sensor of temperature, pH, oxygen concentration, or pressure.

90. (New) A reactor as in claim 89, comprising sensors of each of temperature, pH, and oxygen concentration.

91. (New) A reactor as in claim 58, including a plurality of reaction chambers, attachable to and separable from each other, constructed and arranged to operate in parallel.

92. (New) A reactor as in claim 91, comprising at least 10 reaction chambers constructed to operate in parallel.

93. (New) A reactor as in claim 91, comprising at least 100 reaction chambers constructed to operate in parallel.

94. (New) A reactor as in claim 91, comprising at least 500 reaction chambers constructed to operate in parallel.

95. (New) A reactor as in claim 91, comprising at least 1,000 reaction chambers constructed to operate in parallel.

96. (New) A reactor as in claim 91, comprising at least 10,000 reaction chambers constructed to operate in parallel.

97. (New) A reactor as in claim 58, wherein the chemical or biological reaction occurs within at least one cell.

98. (New) A reactor as in claim 58, wherein the chemical or biological reaction comprises producing a protein.

99. (New) A reactor as in claim 58, wherein the chemical or biological reaction includes fermentation.

100. (New) A reactor as in claim 58, further comprising a collection chamber connectable to the outlet of the reaction chamber.

101. (New) A reactor as in claim 100, wherein the collection chamber has a volume of greater than about one liter.

REMARKS

New claims 49-101 have been added. These claims are supported by the specification. Accordingly, no new matter has been added.

Claim 49 recites a reaction that "occurs within at least one cell." Claim 50 recites a reaction that "comprises producing a protein." Support for these amendments can be found throughout the specification, for example, on page 10, line 19.

Claim 51 recites a reaction that includes fermentation. Support for this amendment can be found in the specification, for example, on page 2, lines 21-22.